

PCT

INTERNATIONAL PRELIMINARY EXAMINATION REPORT

(PCT Article 36 and Rule 70)

Applicant's or agent's file reference 29199PCX279	FOR FURTHER ACTION	See Notification of Transmittal of International Preliminary Examination Report (Form PCT/IPEA/416).
International Application No. PCT/NZ2003/000200	International Filing Date (day/month/year) 9 September 2003	Priority Date (day/month/year) 9 September 2002
International Patent Classification (IPC) or national classification and IPC Int. Cl. <sup>7</sup> C25D 11/30, 11/36, 11/38		
Applicant MAGNESIUM TECHNOLOGY LIMITED et al		

1. This international preliminary examination report has been prepared by this International Preliminary Examining Authority and is transmitted to the applicant according to Article 36.
2. This REPORT consists of a total of 3 sheets, including this cover sheet. <input checked="" type="checkbox"/> This report is also accompanied by ANNEXES, i.e., sheets of the description, claims and/or drawings which have been amended and are the basis for this report and/or sheets containing rectifications made before this Authority (see Rule 70.16 and Section 607 of the Administrative Instructions under the PCT).  These annexes consist of a total of 4 sheet(s).
3. This report contains indications relating to the following items:  I <input checked="" type="checkbox"/> Basis of the report II <input type="checkbox"/> Priority III <input type="checkbox"/> Non-establishment of opinion with regard to novelty, inventive step and industrial applicability IV <input type="checkbox"/> Lack of unity of invention V <input checked="" type="checkbox"/> Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement VI <input type="checkbox"/> Certain documents cited VII <input type="checkbox"/> Certain defects in the international application VIII <input type="checkbox"/> Certain observations on the international application

Date of submission of the demand 7 April 2004	Date of completion of the report 21 December 2004
Name and mailing address of the IPEA/AU AUSTRALIAN PATENT OFFICE PO BOX 200, WODEN ACT 2606, AUSTRALIA E-mail address: pct@ipaaustralia.gov.au Facsimile No. (02) 6285 3929	Authorized Officer  THARU FERNANDO Telephone No. (02) 6283 2486

**I. Basis of the report****1. With regard to the elements of the international application:\***

- ☐ the international application as originally filed.
- ☒ the description, pages 1-35, as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☒ the claims, pages , as originally filed,  
pages , as amended (together with any statement) under Article 19,  
pages , filed with the demand,  
pages 36-39, received on 9 December 2004 with the letter of 9 December 2004
- ☒ the drawings, pages 1/2-2/2, as originally filed,  
pages , filed with the demand,  
pages , received on with the letter of
- ☐ the sequence listing part of the description:  
pages , as originally filed  
pages , filed with the demand  
pages , received on with the letter of

**2. With regard to the language, all the elements marked above were available or furnished to this Authority in the language in which the international application was filed, unless otherwise indicated under this item.**

These elements were available or furnished to this Authority in the following language which is:

- ☐ the language of a translation furnished for the purposes of international search (under Rule 23.1(b)).
- ☐ the language of publication of the international application (under Rule 48.3(b)).
- ☐ the language of the translation furnished for the purposes of international preliminary examination (under Rules 55.2 and/or 55.3).

**3. With regard to any nucleotide and/or amino acid sequence disclosed in the international application, the international preliminary examination was carried out on the basis of the sequence listing:**

- ☐ contained in the international application in written form.
- ☐ filed together with the international application in computer readable form.
- ☐ furnished subsequently to this Authority in written form.
- ☐ furnished subsequently to this Authority in computer readable form.
- ☐ The statement that the subsequently furnished written sequence listing does not go beyond the disclosure in the international application as filed has been furnished.
- ☐ The statement that the information recorded in computer readable form is identical to the written sequence listing has been furnished

**4. ☐ The amendments have resulted in the cancellation of:**

- ☐ the description, pages
- ☐ the claims, Nos.
- ☐ the drawings, sheets/fig.

**5. ☐ This report has been established as if (some of) the amendments had not been made, since they have been considered to go beyond the disclosure as filed, as indicated in the Supplemental Box (Rule 70.2(c)).\*\***

\* Replacement sheets which have been furnished to the receiving Office in response to an invitation under Article 14 are referred to in this report as "originally filed" and are not annexed to this report since they do not contain amendments (Rules 70.16 and 70.17).

\*\* Any replacement sheet containing such amendments must be referred to under item 1 and annexed to this report

**V. Reasoned statement under Article 35(2) with regard to novelty, inventive step or industrial applicability; citations and explanations supporting such statement****1. Statement**

Novelty (N)	Claims 1-30	YES
	Claims	NO
Inventive step (IS)	Claims 1-30	YES
	Claims	NO
Industrial applicability (IA)	Claims 1-30	YES
	Claims	NO

**2. Citations and explanations (Rule 70.7)****Novelty and Inventive Step**

The present invention is directed to a method of chemically and/or electrochemically polishing the surface of a magnesium or magnesium alloy while immersed in a composition of one or more of the following components: a phosphoric acid solution, monopropylene glycol, ethylene glycol, and nitric acid. Performing this step prior to passivating the surface allows the polishing step to be more controlled in generating a uniformly bright surface.

The closest prior art to the present invention are the following documents:

DE 19800035

EP 908632

WO 2000/044557

However, none of these documents anticipate chemically and/or electrochemically polishing the surface of a magnesium or magnesium alloy while immersed in the specified composition prior to a passivation step.

Therefore the present invention is novel and inventive over the documented prior art.

**Industrial Applicability**

Claims 1-30 relate to an industrially applicable invention.

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CLAIMS

1. A method of polishing and/or brightening a magnesium or magnesium alloy surface comprising the steps of:

- i) polishing the surface, and
- ii) passivating the polished surface,

wherein the polishing step is carried out by a chemical polish and/or electro-chemical polish while said surface is immersed in a polishing composition of one or more of the following components; a phosphoric acid solution, monopropylene glycol, ethylene glycol, and nitric acid.

2. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 1, wherein the method further comprises an initial step of pre-treating said surface to remove surface contaminants.

3. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 2, wherein said pre-treating step comprises chemically etching said surface and/or degreasing said surface.

4. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 2 or claim 3, wherein surface contaminants are removed during the pre-treatment step by contacting said surface with one or more degreasing components, such as sodium hydroxide.

5. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 3, wherein said chemical etching component is nitric acid solution and/or phosphoric acid.

6. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said chemical polish and/or electro-chemical polish removes surface layers and/or reduces microscopic high points from the surface.

7. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said electro-chemical polish is a galvanic electrolysis.

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8. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said electrochemical process further includes the supply of an external voltage to said surface.
9. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein during said electrochemical polish an electrolyte anti-stagnation means is utilised or an AC voltage is applied to the electrolyte containing said surface.
10. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 9, wherein said electrolyte anti-stagnation means is an electrolyte stirrer and/or an ultrasonic wave generating means.
11. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said polishing step is followed by an intermediary wash removing at least some of the chemical and/or electrolyte solution from said surface.
12. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 11, wherein said intermediary wash is carried out in a composition containing monopropylene glycol and/or ethylene glycol.
13. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said polishing step is followed by an alkaline wash.
14. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 11 or claim 12, wherein said intermediary wash is followed by an alkaline wash.
15. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 13 or claim 14, wherein said alkaline wash substantially neutralises acids and/or substantially removes Aluminium, Manganese or Zinc from said surface.
16. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 13 or claim 14, wherein said alkaline wash is carried out in a composition containing sodium hydroxide.

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17. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said passivating step provides a substantially corrosion resistant and/or water insoluble surface coating or film.
18. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 17, wherein said substantially corrosion resistant and/or water insoluble surface coating or film is a phosphate salt coating or film.
19. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 17 or claim 18, wherein said passivating step voltage is varied to alter said substantially corrosion resistant and/or water insoluble surface coating or film thickness.
20. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein an inorganic material coating or sealer is applied to said substantially corrosion resistant and/or water insoluble surface coating or film.
21. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 18, wherein said inorganic material coating or sealer is substantially transparent and/or substantially provides corrosion protection and/or at least provides some protection from mechanically induced damage.
22. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 20 or claim 21, wherein said inorganic material coating or sealer is a silicon based composition, such as a disodium metasilicate, and a polyacrylamide coagulant in de-ionised water.
23. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims, wherein said passivating step and/or said inorganic material coating or sealer step is followed by a surface drying step.
24. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of the preceding claims including the pre-treatment steps of:
  - a. immersing the surface in an iron based solution,
  - b. activating said surface with said iron based solution, wherein said iron based solution is reduced to thereby deposit iron on said surface,

- c. etching said surface with an etch composition to modify the activated surface layer,
- d. stripping iron deposits from said surface with an iron removal composition, and
- e. washing said surface to substantially remove compositions remaining on said surface.

25. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 24, wherein said activator is a solution selected from the following; ferric chloride, hydrochloric acid, ammonium bifluoride, and ammonium bromide.

26. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim 24 or claim 25, wherein said etch composition is selected from the following; ferric chloride; ferric chloride and phosphoric acid solution, or a reduced solution of ferric chloride and phosphoric acid.

27. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in claim any one of claims 24 to 26, wherein said iron removal composition is selected from the following; nitric acid and sodium borate in solution, or nitric acid and phosphoric acid in solution.

28. A method of polishing and/or brightening a magnesium or magnesium alloy surface as claimed in any one of claims 24 to 27, wherein said step of washing said surface is carried out with a water wash or an alkaline wash.

29. A method of polishing and/or brightening a magnesium or magnesium alloy surface substantially as hereinbefore described and with reference to any one of the accompanying drawings.

30. A magnesium or magnesium alloy surface polished or brightened according to the method substantially as hereinbefore described and with reference to any one of the accompanying drawings.